

FLOOR CLEANING DEVICE WITH MOTORIZED VIBRATORY HEAD

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to U.S.
5 Provisional Application No. 60/430,721, filed December 3,
2002.

STATEMENT OF FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not applicable.

BACKGROUND OF THE INVENTION

10 [0003] The present invention relates to cleaning
implements, and in particular to powered devices for
cleaning hard surfaces, such as wood and vinyl floors
commonly found in homes and/or residential living
quarters.

15 [0004] Household cleaning materials are well known, as
is their use with cleaning pads. Powered devices have
been developed to make easier the process of applying
such materials, and to improve cleaning efficacy of
heavily soiled surfaces. Several such devices comprise
20 electrically powered hand-held apparatus. Some of such
devices involve linear reciprocal motion and/or orbital
motion of cleaning pads or sponges. Each of these
powered devices generally includes a housing containing a
drive motor with a rotating shaft that either rotates or
25 reciprocates (in a straight horizontal or orbital path) a
cleaning head, via suitable coupling between the
rotating, vertically oriented, drive shaft and the
cleaning head.

[0005] Some devices involve attached replaceable
30 cleaning pads to the cleaning head, for example, using
hook and loop attachments, such as Velcro® brand fasteners
(e.g. U.S. patent 6,253,405).

[0006] Other devices employ separately contained
cleaning/polishing compounds applied to the cleaning head
35 or directly to the surface being cleaned. Still others
incorporate such compounds within the device or within
the pads, for example, by pre-impregnating pads that are
attached to the heads. However, there is no known

powered cleaning device with a mop-styled handle, which utilizes the combination of dual motored, induced direct up and down, i.e. vertical plane oriented, vibration to enhance efficacy of the cleaning agents and/or cleaning pads secured to mop heads.

[0007] Accordingly, such an improved powered cleaning device would be useful, particularly for cleaning hard surfaced floors.

SUMMARY OF THE INVENTION

[0008] In one described embodiment, the invention provides a powered cleaning device with a mop-style handle, having dual motors with associated vibration units mounted on opposed lateral portions of a mop head. The mop head is secured to the bottom of the mop handle, and the handle is attached to the mop head housing via a flexible oscillatory yoke. Drive shafts extend horizontally from motors which, in one embodiment, are mounted internally within the head. The motor shafts are affixed to rotary driven shafts having eccentric weights that impart substantially vertical vibrations to the head housing. The housing is thereby induced to vibrate up and down with respect to a floor over which the device is being operated, whenever the motors are actuated. As part of the overall cleaning device structure, a fluid cleaning composition is dispensed to the floor surface via a fluid canister actuated by a handle-mounted trigger spray mechanism.

[0009] In one described form the fluid cleaning composition is carried in an aerosol can, and its dispersal is triggered by and from the mop handle. Alternatively, the fluid cleaning composition may be carried in a fluid bottle with a similarly actuated trigger spray mechanism.

[0010] Another embodiment of the invention provides a mop handled powered cleaning implement with dual motors for generating counteracting vibratory cleaning

capability, wherein each laterally spaced vibratory unit operates out of phase or non-synchronously with respect to the other. For this purpose, each vibratory unit is eccentrically coupled to its respective motor drive shaft so that when a horizontal driven shaft (of the vibratory unit) is rotated the mop head vibrates in a generally vertical or up and down fashion with respect to the floor. The result is a non-synchronized mode of operation, wherein each lateral head portion or side moves in a back-and-forth oscillatory motion about the mop head yoke, thus inducing a side-to-side slapping motion of mop head on the floor.

[0011] In one envisioned embodiment, the vibratory units, as well as the motors are separate, and each is detachable from the housing head. In addition, the vibratory units and motors are situated atop of the head, separate and distinct from removable cleaning pads adapted to be fixed to the bottom of the head.

[0012] In the several forms described, the apparatus is powered by batteries that may be rechargeable, and that are disposed in or atop of the head housing. At least one power switch is electrically coupled between respective batteries and motors, with only one switch being normally preferred, even for dual motored systems. The single "on-off" switch is actuated by foot for manufacturing simplicity. Moreover, the motors are each adapted to reciprocate the housing head within a speed range that falls between 500 and 8,500 cycles per minute.

[0013] The head housing ideally comprises a substantially rigid body. As a result, it is feasible to control, including dampen, levels of vibration otherwise imparted to both the cleaning apparatus including its handle. A layer (or layers) of foam can be interposed between the head (containing the vibrating mechanism) and the handle for this purpose.

[0014] The cleaning pad contemplated herein can include woven or non-woven materials, including cloth, micro-fibers, rubbers, and polymers. Cleaning pad materials having bristles or foam rubber-like characteristics are also potentially feasible. Various surface treatment compositions can employ any room temperature physical state including liquid, gel, paste, solid and granular. Such surface treatment compositions are preferably cleansers or polishes, or any of surfactants, solvents, chelants, biocides, builders, abrasives, polymers, pH adjusters, bleaches, waxes, silicones, fluorocarbons, perfumes and dyes. Depending on a particular embodiment, the surface treatment composition can be applied directly to the cleaning device, or can alternatively be applied directly to the floor.

[0015] These and other features of the invention will be apparent from the detailed description and the drawings presented herewith, as representative of several currently envisioned embodiments of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] Figure ("FIG.") 1 is a perspective view of a mop handled, powered cleaning/polishing device according to the present invention, some of the interior components shown partially in phantom.

[0017] FIG. 2 is an enlarged perspective view of the mop head of the device of FIG. 1.

[0018] FIG. 3 is a cross-sectional view of one vibratory unit and its associated electric motor, revealing details of drive and driven shafts, and the eccentric weights affixed thereto, in one described embodiment.

[0019] FIG. 4 is an elevation view of an alternate embodiment, wherein vibratory units, motors, and

batteries are fixed externally, i.e. to the upper exterior surface, of the mop head housing.

DETAILED DESCRIPTION OF EMBODIMENTS

[0020] The present invention provides a manual handle-operated motorized device designed for cleaning and/or scrubbing of hard floor surfaces such as found in kitchens and bathrooms, wherein the floors are more often susceptible to caked-on food, dirt, mildew, and or other stubborn cleaning issues. It should be noted that the described device is not necessarily limited to cleaning, but may also be used for buffing and or polishing, or other treatment of hard floor surfaces. Thus, the inventive device is also capable of performing a variety of non-cleaning functions even though the various features and components of the inventive device are specifically discussed herein solely within the context of cleaning. As such, it is to be observed that there is no intentional effort herein to exclude suitability or desirability of non-cleaning applications with respect to the inventive device described.

[0021] Additionally, the terms "vibrate" and "reciprocate" are used interchangeably herein, and mean back and forth or oscillatory motion, either along a relatively straight line or in a substantially straight path.

[0022] Referring initially to FIG. 1, a powered cleaning device 10 is constructed in accordance with the herein-described invention. The device 10 has a head 12 that is preferably made of a rigid plastic (instead of metal) for optimizing cleaning efficacy and economy. The head 12 defines a head housing 14 that is secured to a manually operated handle 16 (also a plastic part) via an attachment yoke 18. Optionally, a foam or cushion layer (not shown) may be interposed between the attachment yoke

18 and the housing 14 to assure insulation and or dampening of vibrations between the housing and handle.

[0023] An ergonomically designed trigger portion 20 is situated at the end of the handle opposite the head 12.

5 A contoured hand grip 22 of the trigger portion 20 is also formed of plastic, and is adapted to facilitate grasping of the device with either hand during use. The hand grip 22 contains a spring-loaded trigger mechanism 24 as part of a system designed to actuate an aerosol
10 canister 26. The canister 26 contains a cleaning solution adapted to be sprayed out of a nozzle (not shown) situated in the canister end 19. The canister 26 may be latched or otherwise fixed into place within a canister holder 28.

15 [0024] The head 12 has an elongated lateral dimension greater than its front to rear dimension. As such, distinctive left and right half portions 9 and 11 define lateral sides of the head 12, respectively positioned on either side of the attachment yoke 18.

20 [0025] The head housing 14 contains the power and drive components (discussed below), supporting the components within and to its interior body. The housing 14 has an opening (not shown) for a power socket to recharge batteries, a foot-operated power switch 36, and
25 openings (none shown) for the removal and changing of defective components.

[0026] Referring next to FIG. 2, a more detailed view of internal components contained within the head 12 is provided. Left and right half portions 9 and 11 are
30 virtual mirror images of each other, and share like numbered components distinguished only by primes. Thus, each vibratory unit 30 is coupled directly to and driven by an electric motor 32. The electric motors are powered by batteries 34 (which may or may not be rechargeable),
35 and are actuated by the foot-operated switch 36.

Hardwired electrical circuitry (not shown) connects all

of the described actuated components. It will be appreciated by those skilled in the art that the switch 36 is interposed between the motors 32 and batteries 34, and operates to open and close, i.e. to "switch", an electrical circuit running between the latter components.

[0027] In operation, the motors of the cleaning device 10 are switched on via the on-off switch 36. In a first mode of operation, the motors 34 will rotate at virtually equal speeds. The ultimate objective is to enhance cleaning efficacy of the cleaning pad 40.

However, in a second mode of operation, a non-synchronous speed switch 38 (FIG. 1), situated on the trigger portion 20 of the mop handle 16, causes the motors to operate at different speeds in a manner that a beat frequency is created. This phenomenon operates to induce an oscillatory back-and-forth vibratory motion of the head 12 about the mop head attachment yoke 18, inducing a side-to-side slapping motion of mop head 12 against a floor surface to further enhance efficacy of cleaning in particularly difficult cleaning circumstances.

[0028] Referring now to FIG. 3, a more detailed view of the vibratory unit 30 and electric motor 32 is presented. It will be appreciated that both the vibratory unit 30 and electric motor 32 are secured to a floor 42 of the head housing 14. Referring back to FIG. 2, it will also be appreciated that the cleaning pad 40 is removably secured to bottom side of the same floor 42. A set of windings 33 contained within the motor encircles a motor drive shaft 44' coupled to a driven shaft 44. Excitation of the windings produces rotation of the motor shaft 44', and because the shafts are coupled together by mating flanges 46, 46', the shafts rotate about a common centerline a-a oriented parallel to the floor 42. In the described embodiment, the shafts are secured together by a plurality of fastening members 47, and are supported on bearings 48 and 50, as shown. Also, in the environment

described, the two mating flanges 46 of the driven and drive shafts 44 together form an eccentric weight 46 adapted to rotate with the shafts 44 to produce the desired vibration.

5 **[0029]** Finally, an additional embodiment of the head 12' is depicted in FIG. 4. The vibratory units 30, electric motors 32, and the batteries 34 are all situated atop of a modified housing 14'. Those skilled in the art will appreciate that this version represents a
10 substantially economical approach relative to the versions already described. To the extent that all of the components are exposed, it is suggested that they be encapsulated with a type of vinyl or thin molded plastic covering, even transparent if desired, to protect the
15 electrical component parts from an otherwise inevitable intrusion of cleaning solution moisture. It will also be noted that in this version the wires 31 are external or uncovered as well, and would thus also be desirably insulated or sealed against intrusion of moisture.

20 **[0030]** It will be appreciated that the various described embodiments of the invention are merely examples of currently envisioned constructions. Numerous modifications and or variations of the described
25 embodiments will become apparent to those skilled in the art, and may fall within the spirit and scope of the as-claimed invention. Therefore, this invention is not limited only to the described embodiments.

INDUSTRIAL APPLICABILITY

30 **[0031]** The invention provides an improved powered cleaning device.